

Geochemical Analysis of Late Middle Pennsylvanian Cores From Southern Indiana

Alyssa Henke

Department of Earth Sciences

Indiana University- Purdue University Indianapolis

During the late middle Pennsylvanian (~300 Ma) southern Indiana was a tropical inland, (epeiric) sea characterized by repeated fluctuations in sea-level. During this period, a massive glacier covered much of an ancient continent: Gondwana. When the ice area expanded during the Pennsylvanian, sea-level lowered, forming extensive peatlands along the exposed shores. The geologic record also shows there were periods when the amount of ice decreased, and the melting water raised sea-level, flooding the coastal peatlands. The coal layers formed from the compaction and lithification of the extensive peat-beds have been studied for economic value. These coals retain some record of sea-level fall and subsequent rise. Above the coal seam is a layer of organic-rich black shale, deposited during a transgression as seawater flooded the area. However, this interpretation is debated because marine fossils are not always deposited at these transitions. We are using reactive iron, pyrite concentrations, and sulfur isotopes as paleoenvironmental proxies for glaciation, atmospheric CO₂, and dust and iron influx. Pyrite accumulation in shale is controlled by sulfate availability, reactive iron delivery, and quantity of organic matter. Using data from pyrite extraction, sulfur concentration can be used in conjunction with reactive iron totals as a proxy for determining freshwater or marine dominated system environments. Sequential iron extractions can determine mineral speciation of Fe, to show how much iron is locked in the sediment as sulfides, oxides, and carbonates. In addition, highly reactive iron and total iron ratios (Fe_{HR}/Fe_T) is an indication of oxic, anoxic, or euxinic (anoxic and sulfidic) conditions, and can be used as a representation of dust input from the erosion of ancient mountain ranges. Preservation of highly reactive iron occurs in an anoxic environment. We anticipate that the data may provide evidence for anoxic or euxinic depositional environment, with a possibility of high dust input.